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OPERATING EXPERIENCE WEEKLY SUMMARY

Office of Nuclear and Facility Safety

August 13 - August 19, 1999

Summary 99-33

Operating Experience Weekly Summary 99-33

August 13 - August 19, 1999

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EVENTS

1. MINOR EXPLOSION DURING WELDING ACTIVITIES

On August 13, 1999, at the Sandia National Laboratory—Albuquerque, a subcontractor welder was welding materials for an elevator at the Process Environmental Technology Laboratory construction site when a minor explosion occurred. Emergency personnel, including the Kirtland Air Force Base Fire Department, an ambulance, and the site incident commander, responded to the scene. They determined that the blast was limited to the immediate area of the welding activity. Only the welder was injured, and ambulance personnel treated him for minor injuries, and transported him to a hospital. A Sandia representative issued a stop work order, established an exclusion zone around the elevator, and monitored the area for levels of volatile organic compounds. Sandia managers immediately initiated an investigation of the explosion. DOE representatives will closely monitor the investigation. OEAF engineers will provide additional information about the investigation as it becomes available. (ORPS Report ALO-KO-SNL-NMFAC-1999-0013)

KEYWORDS: construction, explosion, industrial safety, injury, welding

FUNCTIONAL AREAS: Construction, industrial safety

2. ELECTRICAL NEAR MISS DURING POSTHOLE DIGGING

On August 12, 1999, at the East Tennessee Technology Park, subcontractor workers using a portable, powered, posthole digger to install a new fence struck and breached a 2-inch polyvinyl chloride groundwater transfer line. The workers stopped drilling when they noticed water coming from the hole and excavated with handtools to expose the broken line. When they uncovered the line, they discovered an energized 480-V line running in the same trench. Facility operators stopped the pumps feeding the transfer line to terminate the leak, and the workers ceased all drilling operations until facility personnel can positively locate and mark the underground lines. If the workers had bored into the energized 480-V electrical line, they could have been seriously or fatally shocked. (ORPS Report ORO--BJC-K25GENLAN-1999-0013)

Investigators determined that the 480-V electrical line supplied power to well pumps used to pump groundwater through the transfer line. They also determined that both lines were installed approximately 2 years ago. Investigators determined that the subcontractor workers had authorization to perform the posthole digging under an approved excavation permit that was prepared using facility drawings. However, two sets of drawings existed. One set had been revised to reflect the installation of the electrical and transfer lines, but the drawings used to prepare the permit did not show the lines. Investigators also determined that neither the subcontractors nor site personnel performed a subsurface survey to verify the absence of hidden utilities. Additionally, no one from the facility visited the job site before the workers began drilling. Facility managers are investigating to determine why site personnel used an unrevised set of drawings to prepare the excavation permit. They are also reviewing other facility drawings to ensure they accurately reflect as-built installations.

NFS has reported many events concerning drilling or excavation operations that breached hidden underground utilities because of inaccurate as-built drawings. Some examples follow.

- Weekly Summary 99-27 reported that a backhoe operator at the Los Alamos National Laboratory Accelerator Complex snagged a 208-V electrical cable and two communications lines during excavation for a construction project. The drawings used by the construction crew did not show the three lines, but newer drawings were available that did show them. Although the crew requested the most recent drawings, they did not receive them before they started work. (ORPS Report ALO-LA-LANL-ACCCOMPLEX-1998-0006)

- Weekly Summary 99-10 reported that a backhoe operator at the Portsmouth Environmental Restoration Facility struck and severed an energized 480-V cable while excavating to repair a broken water line. Investigators determined that job planners had identified and marked utilities in the excavation area using as-built drawings, had surveyed the area using subsurface detection equipment, and had satisfied all engineering and administrative requirements for the excavation. However, the cable run was not shown on the site's as-built drawings and the subsurface detection equipment may not have been adequate to detect all utilities in all cases. As a corrective action for this occurrence, facility personnel performed an engineering evaluation of subsurface utility detection instruments to select a type that will provide more reliable indication. (ORPS Report ORO--BJC-PORTENVRES-1998-0017)

- Weekly Summary 97-11 reported that a subcontractor worker struck an energized 120-V electrical cable while drilling into a concrete floor at Brookhaven National Laboratory. He saw sparks but was not shocked or injured. Investigators determined that work planners did not identify the location of the cable before drilling started and that the as-built drawings for buried electrical conduit runs did not show the exact location of the conduits. (ORPS Report CH-BH-BNL-PE-1997-0003)

This event underscores the need for an aggressive configuration management program that accurately reflects as-built installations. Many utility lines and cables buried on DOE property are undocumented or poorly documented. Facility managers and DOE prime contractors should ensure that any work performed to install new utilities, particularly utilities that are hidden, is not considered complete until all facility drawings and procedures accurately document the installation. One of the prime contributors to excavation-related events is the inability to detect underground utilities because of over-reliance on as-built drawings. Because of the lack of configuration control at many facilities, as-built drawings should not be relied upon as the only source for the accurate location of underground utilities. The general uncertainties surrounding the existence and precise locations of these utilities demand special planning and execution of any excavation. A good practice that helps identify underground utilities is to bury a colored and conductive ribbon or tape an appropriate distance above the lines to mark their location. The existence and exact location of buried utilities can then be verified in the field using an appropriate combination of radar, magnetic, and sonic detectors. The following references provide additional guidance about excavation safety.

- OSHA 29 CFR 1926, *Safety and Health Regulations for Construction,* subparts .651(b) and .651(a)(3), make employers responsible for identifying underground hazards near a work area. 29 CFR 1926.965(c) requires work to be conducted in a manner to avoid damage to underground facilities. Similarly, work must be performed in a manner that provides protection to the workers. Additional information on trenching and excavation is available from OSHA at http://www.osha-slc.gov/SLTC/trenchingexcavation/index.html.

- DOE/EH-0541, Safety Notice 96-06, *Underground Utilities Detection and Excavation,* provides additional descriptions of excavation events. The notice

describes technology for underground utility detection, specific recommendations for improving excavating programs, and innovative practices used at DOE facilities. The notice states that a central coordinator should not only assist in identifying underground utilities but should also record the findings. The safety notice cites other principal causes of excavation and digging occurrences as failure to use hand-digging because of the pressure of schedules, and failure to detect underground utilities because detection devices were not used or were used ineffectively.

- Hanford Lessons Learned No. 1998-RL-HNF-0026 provides the lessons learned from two excavation occurrences at Hanford and describes the bases for the Hanford excavation safety program. The criteria for obtaining permits, requirements for locating utilities, and descriptions of when hand-digging is required are included in this document.

Safety Notice 96-06 can be obtained by contacting the ES&H Information Center, (800) 473-4375, or by writing to U.S. Department of Energy, ES&H Information Center, EH-72, 19901 Germantown Rd., Germantown, MD 20874. Safety notices are also available at http://tis.eh.doe.gov:80/web/oeaf/lessons_learned/ons/ons.html. The Hanford Lessons Learned document is available at http://www.hanford.gov/ lessons/sitell/ll98/199826.htm.

KEYWORDS: cable, configuration management, excavation, industrial safety, underground, utility

FUNCTIONAL AREAS: Configuration Control, Construction, Industrial Safety

3. PROCEDURAL DEVIATION RESULTS IN SPREAD OF CONTAMINATION

On August 11, 1999, at the Rocky Flats Environmental Technology Site, a process specialist contaminated his personal protective equipment with radioactive nitric acid when he deviated from procedures by opening a valve to perform tap and drain operations. The process specialist's foreman had directed him to open the valve when they realized system draining could not be completed from the location specified in the procedure. When the specialist opened the valve, liquid splashed on him, the ladder he was using, and the floor. He immediately closed the valve and notified radiological control technicians. They surveyed him and found 50,000 dpm alpha contamination on his anti-contamination coveralls, gloves, and booties. Although they did not detect any airborne contamination, radiological control technicians performed calculations to evaluate whether the process specialist received an intake. Radiological personnel collected nasal smears and mouth swabs and performed a lung count for further analyses. Failure to follow procedures resulted in the process specialist becoming contaminated and could have resulted in a serious injury had the acid contacted his skin. (ORPS Report RFO--KHLL-771OPS-1999-0047)

The facility manager held a fact-finding meeting. Meeting attendees learned that the procedure required using drain point "*A,*" connecting tygon tubing from the drain point to a glovebox, and using a vacuum source to prevent leakage. However, when the process specialist opened drain point "*A,*" he noticed there was no vacuum on the system. The foreman assumed that drain point "*B*" would be an adequate substitute, so he directed the specialist to open it. Attendees learned that no one had connected tygon tubing or the vacuum source to either of the drain points and that the foreman did not obtain approval to deviate from the procedure. DOE facility representatives believe that perceived pressure to complete work, combined with a number of newly hired workers, has resulted in a slow decline in proper conduct of operations at the facility. The facility manager placed an administrative hold on similar facility tap and drain operations until corrective actions for this event are identified.

NFS has reported failure to follow procedures in several Weekly Summaries. Some examples follow.

- Weekly Summary 98-17 reported that an electrical arc occurred inside an enriched uranium decontamination activities glovebox at the Rocky Flats Environmental Technology Plutonium and Processing Facility because a process specialist failed to follow a procedure requiring power to be turned off. Investigators believe the arc occurred as the process specialist was lifting the lid for the decontamination fixture and it, or some of the material being processed, contacted energized electrodes in the glovebox. (ORPS Report RFO--KHLL-PUFAB-1998-0028)

- Weekly Summary 98-05 reported that a technician at Lawrence Livermore National Laboratory discovered a "participating guest" from the Naval Research Laboratory operating an open beam, Class II laser without authorization. Investigators determined that the guest operated the laser with the interlocks bypassed and without an approved project work plan. He also operated a Class IIIB, cadmium/helium laser with the interlocks bypassed and without an approved project work plan. (ORPS Report SAN--LLNL-LLNL-1998-0007)

These events underscore the importance of following procedures step-by-step. Some facilities have several levels of procedures, and some procedures may not be required to be available at the job site. However, verbatim procedural compliance is mandatory for all procedural levels. In addition, workers should not be precluded from obtaining any procedure and using it at the job site. Workers must assume responsibility for their work, pay attention to detail, and adhere to procedures and instructions. Personnel at DOE facilities are required to follow established work control programs without exception. When workers cannot proceed with procedures as written, they must stop and obtain approvals for any deviations. The responsibility for ensuring adequate planning and control of work activities resides with line management. Routine monitoring work by facility managers will help ensure that activities are conducted in accordance with facility policy and procedures and ensure that supervisors are enforcing procedural compliance. Facility managers must effectively communicate their expectations for procedural compliance to first-line supervisors. Supervisors should receive training on procedural compliance so they can effectively enforce it and communicate its importance to workers. DOE O 5480.19, *Conduct of Operations Requirements for DOE Facilities*, chapter XVI, "Operations Procedures," provides the following guidance for procedure use.

- Facility personnel should understand the requirements for procedures.

- Facility personnel should conduct facility operations in accordance with applicable procedures that reflect the facility design.

- Facility personnel should have procedures with them and follow them in a step-by-step manner when the procedures contain sign-offs for various activities.

- Facility personnel should reference procedures during infrequent or unusual evolutions when they are not intimately familiar with the procedure requirements.

Personnel at DOE facilities should have a continually questioning attitude toward safety issues. Each individual is ultimately responsible for complying with rules to ensure personal safety. Facility managers should communicate the idea that safety is of prime importance and that all personnel must be committed to excellence and professionalism. Facility managers, work planners, and crafts personnel should review the following references to ensure that personnel understand and follow procedures.

- DOE O 5480.19, *Guidelines for the Conduct of Operations Requirements for DOE Facilities*, chapter I, "Operations Organization and Administration," states that workers and their supervisors should be held accountable for operating

performance. Personnel involved in significant or frequent violations of operating practices should be counseled, retrained, and disciplined, as appropriate. Chapter XVI, "Operations Procedures," states that procedures should be referenced during infrequent or unusual evolutions when personnel are not intimately familiar with the procedure requirements or when errors could cause significant adverse impact to the facility.

- DOE-STD-1056-93, *Guide to Good Practice for Line and Training Manager Activities Related to Training*, chapter 2, "Line Manager Responsibilities," states that line managers and supervisors should continuously emphasize the importance of conducting work activities according to approved practices and procedures. Chapter 5, "Administration of Training Activities," states that training organizations should have missions that are consistent with facility commitments and policies.

- DOE-STD-1120-98, *Integration of Environment, Safety, and Health into Facility Disposition Activities*, provides guidance for enhancing worker, public, and environmental safety. This standard supports integrated safety management system principles to guide the safe accomplishment of work activities, including (1) line management responsibility for safety; (2) clear roles and responsibilities; (3) competence commensurate with responsibilities; (4) balanced priorities; (5) identification of safety standards and requirements; (6) hazard controls tailored to work being performed; and (7) operations authorization. Integrated safety management information can be found at http://tis-nt.eh.doe.gov/ism.

- DOE/EH-0256T, *Radiological Control Manual*, states: "Each person involved in radiological work is expected to demonstrate responsibility and accountability through an informed, disciplined, and cautious attitude toward radiation and radioactivity."

KEYWORDS: conduct of operations, procedures, operations

FUNCTIONAL AREAS: Procedures, Management, Radiation Protection

4. IMPROPERLY STORED NEUTRON SOURCES CAUSE UNEXPECTED EXPOSURES

On August 3, 1999, at the Los Alamos National Laboratory Accelerator Complex, a group leader and an Environment Safety and Health (ES&H) officer discovered that Neutron Science Center employees had received an unexpected neutron radiation dose. The employees received the dose while working in an office adjacent to a room posted as a radiological material area that contained two isotopic neutron sources and a third gamma radiation source. Personnel working in building offices did not know there were sources in a nearby room. The employees' neutron doses from January 1999 to March 1999 were 50 mrem and 17 mrem, respectively. Although these doses did not approach either the reportable thresholds in DOE O 5000.3B, *Occurrence Reporting and Processing,* or the facility As-Low-As-Reasonably-Achievable (ALARA) neutron dose threshold of 500 mrem, imprudent storage of the neutron sources led to unnecessary personnel exposures. (ORPS Report ALO-LA-LANL-ACCCOMPLEX-1999-0019)

A line management review of dosimetry results revealed the unexpected neutron dose readings for the two employees. After health physics personnel validated the positive neutron dose readings, Radiological Control Technicians (RCT) surveyed the building office area, rooms, and adjacent hallways. The survey revealed no detectable neutron doses. However, one of the RCTs discovered a locked room that was posted as radiological material area and believed it might contain a californium-252 neutron source. ES&H and Facility Management personnel gained access to the room and found three neutron sources, including a 55-gallon drum

containing an unknown quantity of californium-252; 2 curies of plutonium-238 configured as a Pu/carbon-13 neutron source; and 300 millicuries of americium-241. Readings for the plutonium-238/carbon-13 source indicated 8 mrem per hour, on contact, and the label on the drum containing the californium-252, listed the source at 130 mrem per hour on contact, although no neutron activity was detectable at the drum surface. RCTs placed the plutonium-238/carbon-13 into a shielded container and moved all three sources to a shielded room.

On August 16, the facility manager convened a critique. Critique members learned that source custodians may have informally transferred responsibility for the sources to a facility waste coordinator, who retired from the company before the source disposal was completed. The two registrable sources were still under the original custodian's name in the registry. A procedure change that included "long-term storage" status caused the source registrar not to follow up with the custodians. They also learned that the building had not been posted as a radiological control area because the offices near the storage room were not occupied when the sources were placed there.

NFS reported other events in the Weekly Summary about unexpected external exposures from improperly stored radioactive source material. Some examples follow.

- Weekly Summary 98-12 reported that an employee at the Idaho National Environmental Engineering Laboratory, Test Area North Operations Facility, received an unexpected radiological exposure to neutrons from an improperly stored americium-beryllium source. Investigators discovered that the americium-beryllium source had been stored on the top shelf of a cabinet that was below the employee's office for at least 6 years. They also determined that radiological engineering personnel did not store the source in a borated polyethylene container as required. (ORPS Report ID--LITC-TANO-1998-0005)

- Weekly Summary 96-08 reported that a health physics technician at Argonne National Laboratory—East detected an elevated background radiation level along the northwest wall of a laboratory. The laboratory is used as an office and is not posted as a controlled area; therefore, personnel were not required to wear dosimetry. The technician determined that the radiation was coming from three 5-gallon metal pails and one 55-gallon metal drum of uncharacterized waste that were stored in an adjacent room. Investigators determined that unmonitored radiation levels were introduced in an office area where personnel received unmonitored radiation exposures. (ORPS Report CH-AA-ANLE-ANLEER-1996-0002)

These events emphasize the importance of ensuring that storage locations for radioactive material and radioactive sources do not present an exposure hazard to personnel working in adjacent areas, including areas above and below the radiation source. The Los Alamos event indicated weaknesses in the facility radiological control and institutional source accountability programs and the lack of clear chain of custody regarding the sources. Fortunately, a review of exposure records revealed the unexpected neutron exposures that eventually led to the discovery of the sources stored in the room adjacent to the office areas.

DOE-STD-1098-99, *Radiological Control*, chapter 4, "Radioactive Materials," provides clear direction on the marking, monitoring, and control of radioactive materials. Part 414, "Radioactive Material Storage," states that a custodian should be assigned responsibility for each radioactive material area, and should conduct walk-throughs of the area and check container integrity. They should also conduct annual or more frequent reviews of each area, with emphasis on decontamination, movement of material to long-term storage locations and disposal of unneeded material. Part 431, "Sealed Radioactive Source Control," requires control and accountability for sealed radioactive sources. A custodian should be appointed to coordinate sealed radioactive source procurement, issue, inventory, leak testing, and other aspects of the sealed source program. Both accountable and non-accountable sealed radioactive sources shall be used, handled, and stored in a manner commensurate with the hazards associated with the

operations involving the sources. The DOE Radiological Health and Safety Policy states that the capability to accurately measure and analyze radioactive materials and workplace conditions, and determine personnel radiation exposure, is fundamental to the safe conduct of radiological operations.

KEYWORDS: ALARA, accountability, dose, external exposure, sealed source, source, radiation protection

FUNCTIONAL AREAS: Radiation Protection

5. ELECTRICAL ARC IN WIRING WHEN BREAKER IS RESET

On August 13, 1999, at the Hanford Site, electricians observed arcing coming from a nearby electrical conduit when they attempted to reset and close a 480-V breaker. The breaker immediately tripped and the electricians placed it in the open position. They installed a danger do not operate tag on the breaker, left the facility, and reported the event to the operations manager. Investigators determined that the electricians attempted to close the breaker before they had fully determined the cause of the breaker trip or had verified that it was safe to close the breaker. (ORPS Report RL0--PHMC-WESF-1999-0008)

Investigators determined that electricians were attempting to restore ventilation at the facility following an electrical outage thought to be associated with a recent severe electrical storm at the site. Because they believed the breaker tripped in response to an electrical surge associated with the storm, the electricians did not extensively investigate the cause of the trip or verify that it was safe to reset the breaker. Investigators determined that the electricians conducted visual inspections and disconnected downstream loads before attempting to reset the breaker. They also determined that the arc occurred at an electrical connection that appeared to be insulated with a single wrap of electrical tape, resulting in a phase-to-ground short. Investigators have not determined if power surges associated with the electrical storm contributed to the failure of the insulation. The facility manager will implement corrective actions that include requiring electricians to measure insulation resistance of circuits using a megger before resetting tripped breakers on those with more than 150 V.

Electric circuits that have become de-energized by the operation of a protective device such as a fuse or circuit breaker must be carefully checked before they can be safely re-energized. Qualified personnel, with training and experience in electrical troubleshooting techniques should use appropriate test equipment to identify and correct the cause of the trip before they re-energize the circuit. Electricians and facility managers should review the following references for more information on resetting tripped circuit breakers.

- 29 CFR 1910.334, *Use of Equipment*, states that after a circuit has been de-energized by a circuit protective device, the circuit may not be manually re-energized until it has been determined that the equipment and circuit can be safely energized. It also states that when the automatic operation of a circuit protection device was caused by an overload rather than a fault condition, no examination of the circuit or connected equipment is needed before the circuit is re-energized.

- Project Hanford Lessons Learned Identifier 1999-RL-HNF-0023, *Reclosing Tripped Electrical Devices,* re-emphasizes the requirements of 29 CFR 1910.334 and recommends that facility managers establish processes for reporting protective device trips to electrical equipment cognizant personnel so that they can detect a history of frequent trips. This lessons learned is available at http://www.hanford.gov/lessons/siteII/ll99/199923.htm.

KEYWORDS: breaker, electrical fault, electrical hazard

FUNCTIONAL AREAS: Electrical Maintenance

6. WORKER EXPOSED TO LEAD ABOVE PERMISSIBLE EXPOSURE LIMIT

On August 11, 1999, at the Savannah River Technology Center, industrial hygienists reviewing sampling data for lead work activities determined that on May 7, 1998, an employee may have been exposed to lead above the OSHA permissible exposure limit. At that time, industrial hygienists had rejected one sample point as statistically invalid because it was significantly higher than any other point in a sampling program. However, the hygienists conducting the current review concluded that the rationale for rejecting the sample point did not provide conclusive justification. They recalculated the exposure with the questionable sample point included and determined, based on a 10-hour work shift, that the employee could have been exposed to 43 micrograms per cubic meter. The corresponding permissible exposure limit is 40 micrograms per cubic meter averaged over 10 hours. Improper handling of lead can cause intakes of toxic amounts of lead. (ORPS Report SR--WSRC-LTA-1999-0029)

The affected employee and others had been moving and stacking lead bricks to remove excess lead. Hygienists had established additional sampling to validate exposure data from previous studies and to characterize airborne lead activities associated with typical lead movements at the Center. NFS reported in Weekly Summary 98-14 that facility managers at the Savannah River Technology Center determined on April 2, 1998, that elements of the lead compliance program did not provide adequate guidance to protect workers. The site lead compliance program procedure stated that workers could move ten lead bricks during pre-defined tasks without additional lead-specific administrative and engineering controls, However the procedure did not specify what constituted a pre-defined task, and the language of the procedure allowed individual interpretations. On one occasion, workers had moved several thousand pounds of lead bricks, ten at a time, during a housekeeping task. The Center operations manager curtailed all lead handling at the Center and required approval of facility industrial hygienists prior to lead movement. (ORPS Report SR--WSRC-LTA-1998-0012)

The characterization program was related to corrective actions for the occurrence of April 2, 1998, and was intended to gather data to support a generic job hazards analysis for routine lead handling. Control measures applied to the program included barriers and protective clothing but did not include respiratory protection. All other sample points for similar work on preceding and succeeding days indicate that individual exposures were less than 10 micrograms per cubic meter. The bricks involved were known to be at least 15 years old with significant surface corrosion. The affected employee reported that her work gloves became coated with lead oxide during the work.

Numerous occurrences involving inadvertent exposures to hazardous or toxic metals caused by oxidation, dust, or fumes have been reported to OPRS. Two examples related to lead exposures follow.

- At the Kirtland Office Inhalation Toxicology Research Institute, a field technician was exposed to airborne respirable lead slightly above the permissible exposure limit while he was wiping lead shielding to remove dust and oxidation. Investigators determined that work conditions differed from those that work

planners had anticipated based on an evaluation of information related to handling of lead bricks in 29 CFR 1926, *Lead Exposure in Construction.* They believe that this interim final standard may not have considered oxides of lead or the effects of lead cleaning and sweeping activities. Facility supervisors revised work procedures to require respiratory protection until they could validate the effects of additional engineering controls. (ORPS Report ALO-KO-ITRI-LOVELACE-1995-0003)

- Three technicians at the Lawrence Livermore National Laboratory moved approximately 450 lead bricks at the Experimental Test Accelerator II without wearing respiratory protection. Industrial hygienists instructed the technicians to wear personal air samplers throughout the 90-minute move to gather data on lead operations, but they did not expect airborne lead levels to reach OSHA permissible exposure limits. Industrial hygienists determined that two of the technicians were exposed to greater than the OSHA permissible exposure limit for lead. Approximately 1 month later, industrial hygienists repeated the measurements using 3 supervisory personnel wearing respiratory protection to move 400 lead bricks. They determined that two of the three supervisors were exposed to airborne lead at or above the OSHA permissible exposure limit. Investigators determined that lead-oxide dust was disturbed during brick handling and became airborne. Facility managers implemented corrective actions that included instituting site-wide programmatic limits on handling lead. (ORPS Report SAN--LLNL-LLNL-1992-0041)

Inhalation is the primary means of taking lead into the body, although it may also be absorbed through the digestive tract. Acute lead exposure may result in seizures, coma, and death from cardiorespiratory arrest. Chronic exposure may result in severe damage to blood-forming, nervous, urinary, and reproductive organs. These events underscore the importance of having and using a good lead management program. Lead exposure while transferring and handling lead bricks is not a commonly recognized hazard. Work planners must be particularly sensitive to the presence of lead dust or lead oxide during lead handling tasks. In the activities that led to the overexposures, work planners did not anticipate that workers would be exposed to hazardous levels of lead while handling lead bricks.

The following documents contain information useful to lead compliance program managers and workers.

- DOE 440.1A*, Worker Protection Management for DOE Federal and Contractor Employees*, requires all DOE elements to identify existing and potential workplace hazards and evaluate the risk of associated worker injury or illness. The Order also requires DOE elements to assess worker exposure to chemical, physical, biological, or ergonomic hazards through appropriate workplace monitoring (including personal, area, wipe, and bulk sampling), biological monitoring, and observation.

- DOE 5480.4, *Environmental Protection, Safety and Health Protection Standards*, requires compliance with many regulations and permits, such as the Resource Conservation and Recovery Act. The Act specifies treatment, storage, and disposal requirements for hazardous materials such as lead from “cradle to grave.” Failure to comply exactly with these environmental regulations can result in civil penalties.

- 29 CFR 1926.62, *Lead*, applies to employees who may be occupationally exposed to lead. The regulation states that the employer shall ensure that no employee is exposed to lead at concentrations greater than 50 micrograms per cubic meter of air averaged over an 8-hour period. The regulation also states, in part, that until an employer performs an exposure assessment, the employer shall treat the employee as if the employee were exposed above the permissible exposure limit

and shall implement employee protective measures, including respiratory protection, awareness training, and blood sampling.

Additional information on lead may be found at the National Lead Information Center. The Center's primary goal is to gather and provide information on environmental lead poisoning and prevention for health professionals and the public at large. The Center may be reached at 800-LEAD-FYI. The Center also operates a clearinghouse (800-424-LEAD) staffed by trained information specialists who can provide in-depth technical information on lead-related issues. The Center's URL is http://www.healthy.net/pan/cso/cioi/NLIC.HTM.

KEYWORDS: air monitoring, hazard analysis, industrial hygiene, respirator

FUNCTIONAL AREAS: Industrial Safety, Materials Handling/Storage, Work Planning

7. OSHA FINES COMPANY FOR ALLEGED VIOLATIONS IN CONNECTION WITH HYDROXYLAMINE EXPLOSION

On August 11, 1999, OSHA proposed $641,200 in fines for 20 alleged violations at a Concept Sciences, Inc. (CSI), chemical plant near Allentown, Pennsylvania, where a February 19, 1999, hydroxylamine explosion killed five people and injured several others. The blast completely destroyed a 45,000-square-foot section of the plant, damaged nearby buildings, and rained debris over a wide area. The blast also formed a crater approximately 18 feet in diameter and 4 feet deep in the building's concrete floor. Workers were handling a solution of hydroxylamine and potassium salts when the accident occurred. DOE uses process quantities of hydroxylamine nitrate at the Savannah River F-Canyon, and other sites store legacy hydroxylamine compounds or use them in laboratory quantities. (OSHA Regional News Release USDL 99-222; Weekly Summary 99-09)

Hydroxylamine, NH_2OH, is a commercially available compound with chemical properties similar to ammonia. The compound is soluble in water and is usually supplied as an aqueous solution. The solid form (white crystalline needles) can decompose spontaneously at normal ambient temperatures with a force roughly equivalent to TNT. Very pure aqueous solutions of up to approximately 70 weight-percent of hydroxylamine are considered stable at low temperatures. Stability decreases with any increase in temperature, the concentration of HA, or the presence of certain ionic impurities that tend to catalyze a reaction. The CSI explosion occurred as workers were distilling several thousand pounds of solution mixed earlier in the first production run at the facility.

OSHA investigators determined that an explosive reaction occurred at a 2,500-gallon fiberglass reinforced distiller charge tank containing approximately 750 pounds of the chemical. They could not accurately determine the concentration of hydroxylamine in the charge tank because the reaction consumed or dispersed the contents. According to one news account, however, an employee said that white crystals formed during the distillation and the concentration of hydroxylamine at one location in the process measured 86 weight-percent.

OSHA cited CSI management's failure to protect employees from the explosive potential of hazardous chemicals in citations for 11 willful violations and 9 serious violations. OSHA characterizes willful violations as those committed with an intentional disregard of, or plain indifference to, the requirements of the Occupational Safety and Health Act and OSHA regulations. Serious violations are those in which there is a substantial probability that death or serious physical harm could result, and the employer knew or should have known of the hazard. OSHA alleges in its citation and notification of penalty that CSI management failed to perform the following actions.

- Compile accurate information on the reactivity, thermal and chemical stability, and explosive potential of hydroxylamine at concentrations exceeding 80 percent.

- Compile process safety information that would have allowed employees to identify and understand the hazards involved in working with hydroxylamine.
- Document that some equipment in the process complied with recognized and generally accepted good engineering practices.
- Provide information in a process hazard analysis about incidents in 1997 and 1998 that showed a potential for catastrophic consequences in the workplace.
- Train employees involved in the operating process on specific safety and health hazards and emergency operations, including shutdown and safe work practices.
- Ensure that replacement equipment used in the distillation process would function adequately or safely.
- Accurately report the explosive potential and unstable properties of hydroxylamine in Material Safety Data Sheets.

Concept Sciences has until August 26, 1999, to contest the citations and proposed penalties.

The text of OSHA Regional News Release USDL 99-222 is available at URL http://www.osha.gov/media/oshnews/august99/reg3-19990811.html.

KEYWORDS: chemical, citation, conduct of operations, explosion, fatality, fine, occupational safety

FUNCTIONAL AREAS: Chemistry, Conduct of Operations, Industrial Safety

FINAL REPORT

This section of the OEWS discusses events filed as final reports in the ORPS. These events contain new or additional lessons learned that may be of interest to personnel within the DOE complex.

1. RADIOLOGICAL TRAINING AND QUALIFICATION DEFICIENCIES IDENTIFIED

On June 29, 1999, at the Pantex Plant, facility managers reviewing radiological training records identified approximately 50 site employees who had not received required initial general employee radiological training, had missed attending radiological requalification courses, or whose training qualifications did not match their training matrix requirements. Three of the employees were issued dosimeters and had limited access to radiological areas during the lapse in their radiological qualifications. Although training coordinators knew about the lapse in the employees' training, they had no authority to require the employees to attend the training or become current in their qualifications. The training coordinators verified the names of all employees whose qualifications had lapsed and retrieved their dosimetry. Employees who do not maintain their radiological training requirements could expose themselves and others to radiological hazards that could be prevented or mitigated with the proper level of training and qualification. (ORPS Report ALO-AO-MHSM-PANTEX-1999-0049)

Investigators determined that the direct cause of the event was Personnel Error - Procedure Not Used or Used Incorrectly. Of the three employees issued dosimeters, one had not received initial radiological training and the other two employees held qualifications at a different level

than required in their training matrices. Some employees who had not received initial training or who did not attend requalification courses, did not believe that they needed the training because they did not normally enter radiologically controlled areas. Investigators also determined a contributing cause was Personnel Error - Other Human Error because training coordinators were not aware of changes that had been made to the training matrices of some employees. Investigators determined the root cause of the event was Management Problem - Policy Not Adequately Defined, Disseminated, or Enforced. Division managers were not aware of employees who were delinquent with radiological and other federally mandated training. As a result, they were not aware of the training and qualification deficiencies for those employees. Corrective actions for this event include the following.

- Division training coordinators will provide division managers with monthly reports that list personnel deficient with federally mandated training.

- Emergency management personnel will coordinate changes to employees' training matrices with the division training coordinators to ensure that coordinators are aware of the changes and unnecessary requirements are not included in the training matrices.

- Site personnel will revise the plant standard that addresses radiation safety training to give the radiation safety department manager the authority to remove personnel dosimetry from employees who are delinquent with radiological training requirements.

- Site personnel will revise the plant standard that addresses training to require supervisors to remove an employee from duties requiring training that the employees have failed to complete or keep current.

NFS has reported similar events in several recent Weekly Summaries concerning lapsed training or qualification requirements. These events included a foreman supervising work after his certification had expired, an employee not receiving biennial general employee radiological refresher training, and workers entering radiological areas with expired qualifications.

The Pantex event illustrates the need for training coordinators, supervisors, and employees to review their training program records and controls to ensure that employees are qualified and certified for the tasks to which they are assigned. Employees should also accept the responsibility for meeting qualification requirements. Training organizations should inform supervisors of required employee refresher training, so supervisors can easily track the status of training for workers. This allows supervisors to assign work to qualified workers and schedule training in an effective manner.

DOE-STD-1098-99, *Radiological Control,* chapter 6, "Training and Qualification," implements the requirements of 10 CFR 835.901, "Radiation Safety Training." It establishes radiation safety training programs for individuals who are permitted unescorted access (1) to controlled areas, or who are occupationally exposed to radiation; and (2) to radiological areas, or who perform unescorted assignments as a radiological worker. The standard states that (1) before permitting an individual to enter a radiological area unescorted, training commensurate with hazards in the area shall be completed and (2) general employee or radiological worker training shall be completed at intervals not to exceed 24 months. The standard requires that measures be implemented to ensure each individual's current training status can be assessed as necessary to ensure appropriate job assignments.

Facility managers and supervisors responsible for implementing radiological or other training programs should also review the following references.

- DOE 5480.20, *Personnel Selection, Qualification, Training, and Staffing Requirements at DOE Reactor and Non-Reactor Nuclear Facilities,* provides

requirements for ensuring that all workers are qualified to carry out their assigned responsibilities. Chapter I, section 7.a.(1) and 7.a.(2), provide requirements for developing and maintaining training to meet the position requirements. Requirements for initial and continuing training can be found in sections I.7.c and I.7.d.

- DOE-STD-1060-93, *Guide to Good Practices for Continuing Training*, chapter 7, requires auditable records of personnel training. It also states that supervisors "should have access to qualification records, as necessary, to support the assignment of work to qualified personnel."

KEYWORDS: access control, administrative control, training and qualifications

FUNCTIONAL AREAS: Training and Qualification

OEAF FOLLOWUP ACTIVITY

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